

REMARKS

Claims 1-60 are pending in this application. Claims 1, 3, 5, 8-13, 16-21, 24, 25, 27-30 and 60 have been amended and claims 61-65 have been added by the present Amendment. Amended claims 1, 3, 5, 8-13, 16-21, 24, 25, 27-30 and 60 and new claims 61-65 do not introduce any new subject matter.

Claims 31-59 have been withdrawn from consideration without prejudice pursuant to 37 C.F.R. § 1.142(b), as being drawn to a non-elected invention and have been canceled without prejudice by the present Amendment. In addition, claim 2 has been canceled without prejudice by the present Amendment.

DRAWING OBJECTION

The Examiner has objected to the drawings under 37 C.F.R. § 1.83(a). The Examiner states that the drawings must show every feature of the invention specified in the claims and that the "first continuous trench . . . formed in the horizontal direction" recited in claim 27 must be shown or canceled from the claim.

In response to the objection, Applicants have amended claim 27 to recite that "the first continuous trench is formed to be larger in the horizontal direction than in the vertical direction." This feature is clearly shown in, for example, Figs. 8 and 9A (reference numeral 830) and described at page 11, lines 5-8 of the specification.

Accordingly, Applicants respectfully request that the Examiner withdraw the objection to the drawings under 37 C.F.R. § 1.83(a).

VOLUNTARY SUBMISSION OF BETTER QUALITY DRAWINGS

Applicants attach herewith better quality drawing sheets for Figs. 1-10 and respectfully request that the better quality drawings be included in place of the originally

filed drawings upon issuance of a patent from the instant application.

OBJECTIONS TO THE CLAIMS

The Examiner has objected to claims 5, 8-9, 17, 20, 27 and 28 because the Examiner states that claims 5, 8-9, 17, 20 and 28 contain improper *Markush* group of claims, that it is improper to use the term "comprising" instead of "consisting of".

In response to the Examiner's objection, Applicants have amended claims 5, 8-9, 17, 20, 27 and 28 to eliminate the phrase "one of" and to replace the connector "and" with "or". Applicants respectfully submit that the claims as amended include proper alternative limitations. See MPEP § 2173.05(h).

Therefore, Applicants respectfully request that the Examiner withdraw the objection to claims 5, 8-9, 17, 20, 27 and 28.

Applicants also noticed the use of the "one of" language in claims 10, 12, 13, 16, 18, 19, 21, 24, 25 and 29. Accordingly, in an effort to ensure proper claim construction, Applicants have amended claims 10, 12, 13, 16, 18, 19, 21, 24, 25 and 29 to delete "one of" and replace the connector "and" with "or".

The Examiner has objected to claim 27, which recites a "first continuous trench . . . formed in the horizontal direction". The Examiner maintains that the recited limitation "is not clear because the base claim recites forming of a trench in the back side of the substrate and the trench only can be vertically downward from the top-back surface."

In response to the Examiner's rejection, Applicants have amended claim 27 to recite that "the first continuous trench is formed to be larger in the horizontal direction than in the vertical direction." As stated above, this feature is clearly shown in Figs. 8 and 9A (reference numeral 830) and described at page 11, lines 5-8 of the

specification.

Further, Applicants respectfully submit that the Examiner incorrectly concludes that "the trench only can be vertically downward from the top-back surface". Under the Examiner's reasoning, a trench would have no width in the horizontal direction. It is clear from Applicants' disclosure that the trenches have both vertical and horizontal dimensions (e.g., length and width) and claim 27 as amended recites a relationship between same.

Therefore, Applicants respectfully request that the Examiner withdraw the objection to claim 27.

REJECTIONS UNDER 35 U.S.C. § 112

Reconsideration is respectfully requested of the rejection of claim 3 under 35 U.S.C. § 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicants have amended claim 3 to recite that etching of the semiconductor substrate is stopped at the second diffusion layer. This feature is clearly described at, for example, page 9, lines 5-13 and shown in Fig. 3 (reference numeral 310).

Therefore, Applicants respectfully request that the Examiner's indefiniteness rejection under 35 U.S.C. § 112 be withdrawn.

ALLOWABLE SUBJECT MATTER

Applicants gratefully acknowledge the Examiner's indication of allowable subject matter in claim 2.

Reconsideration is respectfully requested of the Examiner's objection to claim 2 as being dependent upon a rejected base claim. In response to the Examiner's

objection, Applicants have rewritten claim 2 in independent form by amending claim 1 to include the limitations of claim 2.

Accordingly, Applicants respectfully request that the Examiner withdraw the objection to claim 2 and that claim 1 is in condition for allowance.

REJECTION UNDER 35 U.S.C. § 102

Reconsideration is respectfully requested of the rejection of claim 60 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,607,928 ("Eiles").

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the . . . claim." Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989); M.P.E.P. § 2131.

Applicants respectfully submit that Eiles does not disclose or suggest forming a diffusion layer in the semiconductor substrate, and doping the diffusion layer with a dopant having a polarity opposite a polarity of the semiconductor substrate, as recited in amended claim 60. Therefore, Applicants respectfully submit that claim 60 is not anticipated by Eiles.

Accordingly, Applicants respectfully request that the Examiner withdraw the rejection of claim 60 under 35 U.S.C. § 102(e) and that claim 60 is in condition for allowance.

REJECTIONS UNDER 35 U.S.C. § 103(a)

Reconsideration is respectfully requested of the rejection of claims 1, 4, 5 and 7-30 under 35 U.S.C. § 103(a) as being unpatentable over Eiles in view of U.S. Patent No. 5,948,689 ("Hamburgen").

Further, reconsideration is respectfully requested of the rejection of claim 6 under 35 U.S.C. § 103(a) as being unpatentable over Eiles in view of Hamburgen as applied in Paragraph 10 of the May 17, 2005 Office Action and further in view of Wolf, *Silicon Processing for the VLSI Era*, Volume 2-Process Integration, pp. 51-54 (1990) ("Wolf").

CLAIMS 1 AND 4-18

Claim 1 Incorporates Allowable Subject Matter

Applicants have amended claim 1 to incorporate the allowable subject matter of claim 2. Accordingly, Applicants respectfully submit that claim 1 is patentable over Eiles in view of Hamburgen, or Eiles in view of Hamburgen and further in view of Wolf.

Therefore, it is respectfully submitted that the cited references, when taken alone or in combination, do not disclose or suggest the embodiment of the present invention, as defined in amended claim 1, and that it would not have been obvious to modify Eiles, in view of Hamburgen or further in view of Wolf, to develop same.

For at least the reason that claims 4-18 depend from claim 1, claims 4-18 are also submitted to be patentably distinct over the cited references.

The Examiner Has Failed To Establish A Prima Facie Case Of Obviousness With Respect To Claims 15-18

The Examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. See In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); M.P.E.P. § 2142. "To support the conclusion that the claimed invention is

directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." Ex parte Clapp, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

With respect to claim 15, the Examiner cites to element 230 of Eiles as disclosing the active cooling apparatus of claim 15. However, the Examiner has not provided any convincing line of reasoning as to why the heatsink 230 in Eiles teaches an active cooling apparatus. Applicants make a clear distinction between a heatsink, which is a passive cooling device, and active cooling devices, such as, for example, "thermal electric cooling components, micro-fan devices, micropumps and other microelectromechanical systems (MEMS)." See Specification, p. 10, lines 27-32.

There is no teaching or suggestion in Eiles of an active cooling apparatus. The cooling devices mentioned in Eiles are passive, consisting of heat pipes or plates. Similarly, Hamburgden discloses a passive cooling device in the form of heatsink 130.

Accordingly, Applicants respectfully submit that the Examiner failed to establish a *prima facie* case of obviousness with respect to the active cooling apparatus recited in claim 15 (and claims 16-18 dependent thereon).

Moreover, with respect to claims 16-17, the Examiner merely restates the claim language and states that the combination of Eiles and Hamburgden discloses the claim elements. The Examiner generally points to Figs. 2 and 3 and cols. 2-4 of Eiles, and Figs. 1 and 3 and cols. 2-4 of Hamburgden as disclosing the claim elements, but omits any discussion linking the cited passages to the claim elements.

A review of the cited sections of Eiles and Hamburggen reveals that Eiles and Hamburggen, at the very least, do not appear to disclose or suggest the following limitations recited in claims 16 or 17: (1) the opening for allowing coolant supplied from the active cooling apparatus to exit or enter the continuous trench (as stated above, the references do not disclose an active cooling apparatus and, similarly, do not include discussion of coolants or openings therefor); and (2) a thermal electric cooling component, a micro-fan device or a micropump (as stated above, the references do not disclose active cooling apparatuses or types thereof).

Applicants respectfully submit that the Examiner's reasoning in support of the obviousness rejections is based almost entirely on speculation and conjecture and relies on Applicants' disclosure and teachings to supply that which the cited reference lacks.

Accordingly, Applicants respectfully submit that the Examiner has not established a *prima facie* case of obviousness of claims 15-18.

As such, in view of the foregoing, Applicants respectfully request that the Examiner withdraw the rejection of claims 1 and 4-18 under 35 U.S.C. § 103(a) and that claims 1 and 4-18 are in condition for allowance.

CLAIMS 19-30

Like claims 15-18 discussed above, Applicants respectfully submit that the Examiner failed to establish a *prima facie* case of obviousness of claim 19 and claims 20-30 dependent thereon.

Claim 19, recites, *inter alia*, a method of forming an active cooling apparatus on a substrate, comprising forming at least one opening in the first continuous trench for

allowing coolant supplied from the active cooling apparatus to exit or enter the first continuous trench.

As stated above, neither Eiles nor Hamburgden, when taken alone or in combination, disclose or suggest an active cooling apparatus and the Examiner has failed to provide any convincing line of reasoning in support of such disclosure. Further, as stated above, Eiles and Hamburgden do not teach or suggest the opening for allowing coolant supplied from the active cooling apparatus to exit or enter the continuous trench. The references do not include any discussion of coolants or openings therefor, the coolants being defined in Applicants' disclosure as, for example, liquid or gases capable of being pumped through cooling channels. See Specification, p. 11, lines 1-8.

Further, with respect to, for example, claims 20, 23 and 25, the Examiner merely restates the claim language and states that the combination of Eiles and Hamburgden discloses the claim elements. As with claims 16-17, the Examiner generally points to Figs. 2 and 3 and cols. 2-4 of Eiles, and Figs. 1 and 3 and cols. 2-4 of Hamburgden as disclosing the claim elements, but omits any discussion linking the cited passages to the claim elements.

A review of the cited sections of Eiles and Hamburgden reveals that Eiles and Hamburgden, at the very least, do not appear to disclose or suggest the limitations recited in claims 20, 23 or 25. For example, the cited references do not disclose a thermal electric cooling component, a micro-fan device or a micropump, as recited in claim 20. As stated above, the references do not disclose active cooling apparatuses or types thereof.

The cited references also do not disclose a second continuous trench on a

second substrate that is a mirror image of the first continuous trench of the first substrate, as recited in claim 23. Hambrugen, for example, discloses a plurality of fins on a second substrate. However, the plurality of fins on the second substrate are not a mirror image of the fins on the first substrate. Indeed, in order for the fins on the second substrate to be interleaved with the fins on the first substrate, there must be fewer fins on one of the substrates and the fins on opposing substrates must be out of phase with each other. Further, fins are distinct from a continuous trench.

The cited references also fail to disclose the second semiconductor substrate including at least one opening in the second continuous trench for allowing the coolant supplied from the active cooling apparatus to exit or enter the second continuous trench, as recited in claim 25. As stated above, the cited references do not include any discussion relating to coolants or openings therefor. Moreover, there is no showing of a second trench including an opening for a coolant.

Accordingly, Applicants respectfully submit that the Examiner has not established a *prima facie* case of obviousness for claims 19-30.

Applicants also respectfully submit that claim 27, as amended, is patentable over the cited references, since none of the cited references, when taken alone or in combination, disclose a continuous trench formed to be larger in the horizontal direction than in the vertical direction.

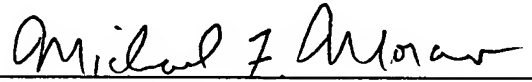
As such, in view of the foregoing, Applicants respectfully request that the Examiner withdraw the rejection of claims 19-30 under 35 U.S.C. § 103(a) and that claims 19-30 are in condition for allowance.

NEW CLAIMS

Applicants respectfully submit new claims 61-65 for consideration and that new claims 61-65 are patentable over the cited references.

An early and favorable reconsideration is earnestly solicited. If the Examiner has any further questions or comments, it is suggested that the Examiner telephone Applicants' Attorney to reach a prompt disposition of this application.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "Michael F. Morano", is written over a horizontal line.

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